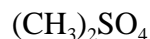


## DIMETHYL SULFATE

Dimethyl sulfate is a federal hazardous air pollutant and was identified as a toxic air contaminant in April 1993 under AB 2728.

CAS Registry Number: 77-78-1



Molecular Formula:  $\text{C}_2\text{H}_6\text{O}_4\text{S}$

Dimethyl sulfate is a colorless, oily liquid with a faint, onion-like odor. It is soluble in water, ether, alcohol, dioxane, acetone, and aromatic hydrocarbons, and slightly soluble in carbon disulfide and aliphatic hydrocarbons. It is stable at room temperature, and rapidly hydrolyzes in water (HSDB, 1993; NTP, 1994a).

### Physical Properties of Dimethyl Sulfate

---

Synonyms: sulfuric acid dimethyl ester; DMS

Molecular Weight:	126.13
Boiling Point:	about 188 °C with decomposition
Melting Point:	-31.7 °C
Flash Point:	83 °C
Vapor Density:	4.35 (air = 1)
Density/Specific Gravity:	1.3283 at 20/4 °C (water = 1)
Vapor Pressure:	0.5 mm Hg at 20 °C
Log Octanol/Water Partition Coefficient:	0.032
Water Solubility:	2.8 g/100 ml at 18 °C
Conversion Factor:	1 ppm = 5.16 mg/m <sup>3</sup>

---

(HSDB, 1993; Merck, 1983; U.S. EPA, 1994a )

## SOURCES AND EMISSIONS

### A. Sources

Dimethyl sulfate is used as an industrial methylating agent for amines and phenols. It has been detected from power plants burning coal. The primary stationary sources that have reported emissions of dimethyl sulfate in California are research and testing facilities (ARB, 1997b).

### B. Emissions

Toxic Air Contaminant Identification

List Summaries - ARB/SSD/SES

September 1997

The total emissions of dimethyl sulfate from stationary sources in California are estimated to be at least 2 pounds per year, based on data reported under the Air Toxics “Hot Spots” Program (AB 2588) (ARB, 1997b).

#### C. Natural Occurrence

No information about the natural occurrence of dimethyl sulfate was found in the readily-available literature.

### **AMBIENT CONCENTRATIONS**

No Air Resources Board data exist for ambient measurements of dimethyl sulfate. However, the United States Environmental Protection Agency (U.S. EPA) has compiled ambient air data from one United States urban location. A mean ambient air concentration for dimethyl sulfate of 7.4 micrograms per cubic meter ( $\mu\text{g}/\text{m}^3$ ) or 1.4 parts per billion was reported in this 1983 study (U.S. EPA, 1993a).

### **INDOOR SOURCES AND CONCENTRATIONS**

No information about indoor sources and concentrations of dimethyl sulfate was found in the readily-available literature.

### **ATMOSPHERIC PERSISTENCE**

Dimethyl sulfate exists in the atmosphere in the gas phase. No reactions of gas-phase dimethyl sulfate with  $\text{O}_3$ ,  $\text{NH}_3$ , water vapor or the OH radical have been observed (Japar et al., 1990a). The calculated half-life and lifetime of dimethyl sulfate due to reaction with the OH radical are greater than 20 days and 28 days, respectively. Dimethyl sulphate may therefore be removed from the troposphere by wet and/or dry deposition (Atkinson, 1995). Its reaction with photochemically-produced hydroxyl radicals will result in an estimated half-life of 6.5 days (HSDB, 1993). Its reaction products include methyl sulfate, hydrogen sulfate, and methanol (Kao, 1994).

### **AB 2588 RISK ASSESSMENT INFORMATION**

The Office of Environmental Health Hazard Assessment reviews risk assessments submitted under the Air Toxics “Hot Spots” Program (AB 2588). Of the risk assessments reviewed as of December 1996, dimethyl sulfate was not listed in any of the risk assessments (OEHHA, 1996a,b).

### **HEALTH EFFECTS**

Probable routes of human exposure to dimethyl sulfate are inhalation, ingestion, and dermal contact (NTP, 1994a).

Non-Cancer: Vapors of dimethyl sulfate are extremely irritating to the eyes and lungs and may cause delayed pulmonary edema. Inhalation and oral exposure may also cause damage to the liver, kidney, heart and central nervous system. Severe blistering may occur from dermal contact. The U.S. EPA has not established an oral Reference Dose (RfD) for dimethyl sulfate or a Reference Concentration (RfC) (U.S. EPA, 1994a).

No information is available in humans regarding adverse reproductive or developmental effects of exposure to dimethyl sulfate. Results from one study of adverse reproductive effects in rats indicated tumors in the offspring of rats injected with dimethyl sulfate (U.S. EPA, 1994a).

Cancer: The U.S. EPA considers available data studies to be inadequate regarding the carcinogenic effects of dimethyl sulfate in humans. Animals exposed to dimethyl sulfate by inhalation have developed tumors in the nasal passages, lungs and thorax. The U.S. EPA has placed dimethyl sulfate in Group B2: Probable human carcinogen (U.S. EPA, 1994a). The International Agency for Research on Cancer (IARC) has placed dimethyl sulfate in Group 2A: Probable human carcinogen (IARC, 1987a).

The State of California under Proposition 65 has determined that dimethyl sulfate is a carcinogen (CCR, 1996). The recommended preliminary inhalation potency value for use in cancer risk assessments is  $4.0 \times 10^{-3}$  (microgram per cubic meter)<sup>-1</sup>. In other words, the potential excess cancer risk for a person exposed over a lifetime to  $1 \mu\text{g}/\text{m}^3$  of dimethyl sulfate is estimated to be no greater than 4,000 in 1 million (CAPCOA, 1993).

